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(54) Fuel level detecting device for fuel tanks

(57) To provide a fuel level detecting device for a fuel tank to which its fuel level detecting unit is capable of being mounted in a position so that its maximum allowed fuel level is easily detected even in the case of variously shaped fuel tanks, a fuel level detecting device for a fuel tank (20) having a fuel level detecting unit (24) disposed

to be adapted to support a float capable of oscillating (26) in the fuel tank (20) with a built-in fuel pump (19) and detecting the fuel level through the oscillations of the float (26); wherein the fuel level detecting unit (24) is capable of being selectably mounted to the fuel pump (19) such that the float (26) oscillates at the different positions in the fuel tank (20).

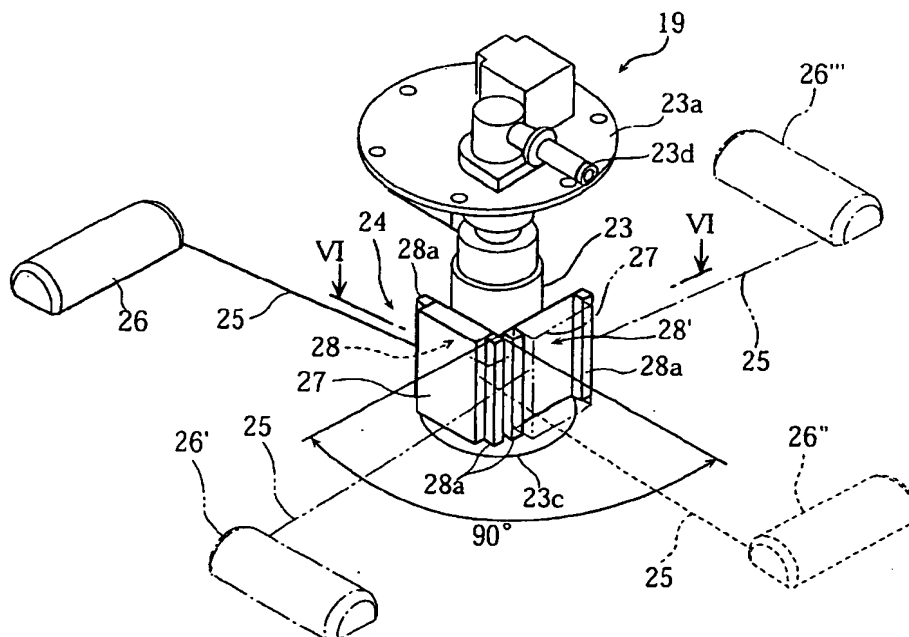


FIG. 5

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Description

[0001] The present invention relates to a fuel level detecting device for fuel tanks with a built-in fuel pump.

[0002] Further, the invention relates to a motor vehicle, in particular scooter-type motorcycle, comprising a fuel tank with a built-in fuel pump and a fuel level detecting device.

[0003] In a conventional fuel level detecting device for detecting the remaining amount of fuel in a fuel tank, a fuel level detecting unit is generally accommodated to be placed in an appropriate position in the fuel tank. In the case of the fuel tank with a built-in fuel pump, the fuel level detecting unit is mounted to the built-in fuel pump so that an inside structure of the fuel tank can be simplified and its assemble ability can be enhanced.

[0004] In the meantime, it is necessary for the fuel pump to be mounted in the fuel tank such that its discharge opening is in an orientation according to that of the piping route of the supply hose. Thereby, a float of the fuel level detecting unit mounted to the fuel pump may not be positioned properly depending on the shape of the fuel tank. For example, the float does not move upward to the fuel level when the tank is filled up with fuel (the maximum allowed fuel level), therefore, there could be cases where the maximum allowed fuel level cannot be detected.

[0005] It is therefore an object of the present invention to provide a fuel level detecting device for fuel tanks which can detect a maximum allowed fuel level, respectively, even in the case of variously shaped fuel tanks.

[0006] It is further the object to provide a motor vehicle, in particular scooter-type motorcycle comprising such a fuel level device.

[0007] This object is solved in an inventive manner by a fuel level detecting device for fuel tanks with a built-in fuel pump comprising a fuel level detecting unit for detecting an actual fuel level within said fuel tank, and a mounting structure being formed at said fuel pump and having a number of mounting seats for an alternative attachment of said fuel level detecting unit.

[0008] Further, for a motor vehicle, in particular a scooter-type motorcycle, the object is solved in that a fuel level detecting device is provided according to one of the claims 1 to 17.

[0009] Therefore, since the fuel level detecting unit is capable of being selectably mounted to the fuel pump, a float of the fuel level detecting unit can oscillate at different positions in the fuel tank, the fuel level detecting unit can be mounted by selecting the position thereof to be fitted so that the float is positioned to reliably detect the fuel level based on the shape of the fuel tank or the like, thereby reliably detecting the maximum allowed fuel level even in the case of variously shaped fuel tanks.

[0010] Preferably, the fuel pump is placed in that fuel tank in a generally vertical direction, thereby said mounting seats are arranged at side faces of said fuel pump thereby enclosing an angle α between one another, said

angle α enclosed between two adjacent mounting seats being preferably 90°.

[0011] Further, said fuel level detecting unit may comprise a base member detachably mountable to a selected one of said mounting seats of said mounting structure and a floatable means being connected to said base member, wherein said base member comprises a sensor generating an output signal according to a position of said floatable means. Said floatable means is preferably connected to said base member via an arm thereby being capable of performing an oscillating movement with respect to the base member.

[0012] Thereby, said floatable means is designed to oscillate at different positions in the fuel tank according to the selected mounting seat.

[0013] In particular, said floatable means is designed to oscillate about a mounting position of said arm at said base member at positions in the fuel tank being generally perpendicular to one another.

[0014] In a preferred embodiment, said base member is connectable by means of a push-fitting connection to a selected one of said mounting seats, in particular by engaging pieces formed at said base member engaging in engaging grooves formed in that mounting seats.

[0015] Accordingly, such a fuel level detecting device for a fuel tank comprises a fuel level detecting unit disposed to be adapted to support a float capable of oscillating in a fuel tank with a built-in fuel pump and detecting the fuel level through the oscillations of the float; wherein the fuel level detecting unit is capable of being selectably mounted to the fuel pump such that the float oscillates at the different positions in the fuel tank.

[0016] Preferably, the fuel level detecting unit has a structure in which an arm with a float supported at its tip is oscillatorily supported by a base member and a sensor that generates output depending on the oscillation angle of the arm is disposed within said base member, and a plurality of mounting seats to which the base member of the fuel level detecting unit is selectably and detachably mounted are formed on the side face of a pump body of the fuel pump that is inserted and placed into the fuel tank generally in the vertical direction.

[0017] In particular, first and second mounting seats are formed adjacent and generally perpendicular to each other on the side face of the pump body, and selectably mounting the base member of the fuel level detecting unit to the first and the second mounting seats enables the float to oscillate at the positions generally perpendicular to each other in the fuel tank.

[0018] As a result of that, the convenient position of the float for detecting the maximum allowed fuel level can be selected depending on the tank shape or the like.

[0019] Further preferred embodiments of the present invention are subject to the subclaims.

[0020] In the following, the present invention is explained in greater detail with respect to several embodiments thereof in conjunction with the accompanying drawings, wherein:

- Fig. 1 is a left side view of a scooter-type motorcycle to which one embodiment of the present invention is applied;
- Fig. 2 is a plan view, showing the above embodiment to which a fuel tank and a fuel injection valve are mounted;
- Fig. 3 is a left side view, showing the above embodiment to which the fuel tank and the fuel injection valve are mounted;
- Fig. 4 is a back view, showing the above embodiment to which the fuel tank is mounted (a sectional view along an IV-IV line of Fig. 3);
- Fig. 5 is a perspective view of a fuel level detecting device of the above embodiment;
- Fig. 6 is a sectional view of a principal part of the above embodiment to which the fuel level detecting device is mounted (a sectional view along a VI-VI line of Fig. 5); and
- Fig. 7 is a sectional view of a principal part of the above embodiment to which the fuel injection valve is mounted (a sectional view along a VII-VII line of Fig. 2).

[0021] Figs. 1 through 7 are views explanatory of one embodiment of the present invention.

[0022] In the embodiment, the terms front, rear, left and right are denoted as front, rear, left and right when viewed from the riding position.

[0023] In the drawing, Fig. 1 shows a scooter-type motorcycle with the following schematic constitution. In other words, a front fork 3 is supported steerably from side to side by a head pipe 2a at the front end of a body frame 2, which allows a front wheel 4 to be pivotably supported at the lower end of said front fork 3 and allows handle bars 5 to be fixed to the upper end thereof. A unitary swing-type engine unit 6 is also oscillatory and pivotably supported at approximately the midsection of the body frame 2 to allow a rear wheel 7 to be pivotably supported at the rear end of said engine unit 6 and to allow a rear wheel suspension system 8 to be linked between said rear end and the rear end of the body frame 2. In addition, a storage box 9 is disposed above the engine unit, enabling said storage box 9 to be opened and closed through a seat 10. Furthermore, almost all of the parts other than the front wheel 4 and the rear wheel 7 are generally enclosed by a body cover 11. They include the forward section of the handle bars 5, peripheries of the entire body frame 2, the forward section of the engine unit 6 and the storage box 9, or the like.

[0024] The storage box 9 has a length extending from approximately the midsection between the front and the rear wheels 4, 7 on their upper portion to the rear extent

of the rear wheel 7 on its upper portion in which a large and generally arc-shaped part protruding downward is formed on its forward section 9a so as to be deep enough to store a helmet. Also, the forward section 9a, when viewed from a cross-section of the perpendicular plane to the center line of the vehicle, has a generally arc-shaped part protruding downward at the bottom of said forward section 9a. The bottom thereof is higher toward the outer side of the vehicle width direction from its lowest end a. The depth of the midsection 9b of the storage box 9 is relatively smaller than that of the forward section 9a. The bottom of the midsection 9b, when viewed from the cross-section, has a substantially larger radius of curvature than that of the forward section 9a while still being adapted to be an arc-shape, and the bottom thereof is higher toward the outer side of the vehicle width direction from its lowest end b.

[0025] The engine unit 6 is constituted to be integrally connected to a water-cooled four-stroke single cylinder engine body 12 and a transmission case 13 in which a V-belt stepless shifting transmission mechanism is accommodated. The rear wheel 7 is pivotably supported at the rear end of said transmission case 13 to which the lower end of the rear wheel suspension system 8 is coupled. The engine body 12 is also connected to a cylinder body 12b, a cylinder head 12c and a head cover 12d through a front wall of a crankcase 12a by combining them so that they wholly extend forward generally in a horizontal direction.

[0026] The engine body 12 is positioned below the midsection 9b of the storage box 9. And an external connection opening 12e of an intake port connected to an internal combustion chamber is positioned on the top face of the cylinder head 12c. An intake manifold 14 connected to the external connection opening 12e extends rearward below the midsection 9b of the storage box 9 to connect to a throttle body 15 at its rear end. Said throttle body 15 is connected to an air cleaner 16. The air cleaner 16 is placed above the transmission case 13 and fixed to said transmission case 13.

[0027] A throttle pulley 15b is fixedly mounted to the left end of a valve axis 15a of a butterfly-type throttle valve disposed within the throttle body 15. Two throttle cables 15c, 15c looped around said throttle pulley 15b are connected to throttle grips of the handle bars 5.

[0028] A fuel injection valve 17 is mounted in the vicinity of the connection point of the intake manifold 14 to the cylinder head 12c. The fuel injection valve 17 is positioned on one side of the vehicle width direction, more particularly, in a part deviating rightward from the lowest end b at the bottom of the midsection 9b of the storage box 9 relative to the intake manifold 14 while being inclined rightward as described above and forward relative to the vertical line c. And a fuel supply opening 17a of the fuel injection valve 17 is directed rearward and leftward of the vehicle and a downstream end 18a of a fuel supply hose 18 is fixedly connected to said fuel supply opening 17a.

[0029] The fuel supply hose 18 extends leftward of the vehicle from the fuel injection valve 17 to the space between the intake manifold 14 and the bottom of the mid section 9b, and then extends forward running along the left side of the engine body 12 to allow the upstream end 18b thereof to be connected to a discharge opening 23d of a fuel pump 19 discussed later. The fuel pump 19 is inserted and placed into the fuel tank 20. Said fuel tank 20 is positioned forward of the engine body 12 and placed so as to allow its rear-half section to be positioned below the forward section 9a of the storage box 9.

[0030] The fuel tank 20 is adapted to be a generally rectangular shape in the plane view and consisting of two halves jointed together, a lower-half section 21 and an upper-half section 22 made of sheet metal. Flanges 21a, 22a, respectively bent and formed along the perimeter of the upper opening of the lower-half section 21 and that of the lower opening of the upper-half section 22, are welded to be jointed.

[0031] While a bottom 21b of the lower-half section 21 stands generally flat, a top surface 22b of the upper-half section 22 is wholly formed with greater height toward its forward section, thereby preventing it from being interfered with by the forward section 9a of the storage box 9 and maintaining capacity of the fuel tank. A filler pipe 22f is projected from a front protrusion 22e at the highest position of the top surface 22b and a filler cap 22g detachably fitted to said filler pipe 22f is faced outward when an lid 11b formed openably and closably in a footboard 11a area of the body cover 11 is opened.

[0032] On the left side portion of the rear-half section of the top surface 22b is formed a step 22c made lower down in order to mount the fuel pump 19 thereon. The fuel pump 19 is fixed to said fuel tank 20 by which a pump body 23 is inserted downward into the fuel tank 20 in the generally vertical direction from mounting holes 22d formed on the step 22c, and a flange 23a formed at the upper end of said pump body 23 is fastened through the mounting holes 22d along its outer edge with bolts. The pump body 23 incorporates a pump mechanism in which a filter 23c is mounted to an inlet opening 23b at its lower end.

[0033] The discharge opening 23d formed at the upper end, which protrudes outward of the pump body 23 is slightly directed aslant forwardly to the left side and the downstream end 18b of the fuel supply hose 18 is connected to said discharge opening 23d so as to prevent it from being interfered with by the downward protrusion of the forward section 9a of the storage box 9 by allowing the downstream end 18b to go forward of and around said protrusion.

[0034] In here, the fuel pump 19 is placed so as to deviate leftward of the vehicle. More particularly, said fuel pump 19 deviates leftward from the lowest end at the bottom of the forward section 9a of the storage box 9. The discharge opening 23d of the fuel pump 19 is also directed outward in the deviating direction.

[0035] In addition, reference numeral 29 is denoted

as a radiator which is placed so as to be in a position forward of the fuel tank 20 and between a left and a right down tubes 2b, 2b when viewed from the front of the vehicle, and so as to be in an upright position in the generally vertical direction.

[0036] A fuel level detecting unit 24 is mounted to the pump body 23 positioned in the fuel pump 19 of the fuel tank 20. The fuel level detecting unit 24 is made of metal or resin, and has a structure in which a float 26 consisting of sealed semicylindrical body is fixed to a tip of an arm 25 fabricated from a rod, and a base end of said arm 25 is oscillatory supported by a box-shaped base member 27. A sensor (potentiometer) that generates a variable voltage signal depending on the oscillation angle of the arm 25 is accommodated within the base member 27.

[0037] The base member 27 is capable of being selectively mounted to either the first or the second resin mounting seats 28, 28' of the pair, which are formed on the outer face of the pump body 23. The mounting seats 28, 28' are placed adjacent and perpendicular to each other. Each of said mounting seats 28, 28' has a pair of mounting rails 28a, 28a formed according to the width dimensions of the base member 27. When the base member 27 is push-fitted between each of said mounting rails 28a, 28a, an engaging piece 27a projected from the left and the right edge faces of said base member 27 is engaged in each of engaging grooves 28b formed into the mounting rails 28a, thereby mounting the fuel level detecting unit 24 as well as the base member 27 to the fuel pump 19. In addition, when removing the fuel level detecting unit 24, inserting a flat-blade driver or the like into the space between the base member 27 and the mounting seats 28, 28' allows the engaging piece 27a and the engaging grooves 28b to be released from each other.

[0038] Here, as shown by solid lines in Fig. 5, in this embodiment, the base member 27 is mounted to the first mounting seat 28 on the left side in Fig. 5, therefore, the float 26 is positioned protruding leftward in Fig. 5. Viewing the float 26 as mounted to the inside of the fuel tank 20, as shown by phantom lines in Fig. 4 (the view from the arrow VI direction in Fig. 3) the float 26 can be positioned in a relatively higher part 22b' adjacent to the step 22c of the fuel tank 20. As a result of this, a relatively wide range of the oscillation of the float 26 is ensured, generally enabling it to detect the maximum allowed fuel level.

[0039] In addition, in Fig. 5, when the base member 27 of the fuel level detecting unit 24 is mounted to the second mounting seat 28' on the right side, the float 26' would be rotated 90° relative to the position described above as shown by the phantom lines. Thus, the float can oscillate at the two different positions perpendicular to each other. The float 26" constituted so as to be positioned as shown by dotted lines therein may also be employed as the fuel level detecting unit 24 and when the fuel level detecting unit constituted in such a manner

is mounted to the second mounting seat 28' on the right side, the float 26^m results in being positioned as shown by dashed lines therein.

[0040] Description will be next made of the operations and effects of the invention.

[0041] In the storage box 9 in the cross-sectional view, said storage box 9 has a generally arc-shaped part protruding downward, more particularly, the forward section 9a and the midsection 9b at its bottom, and the fuel injection valve 17 is disposed to the connection point of the intake manifold 14 to the cylinder head 12c and so as to deviate rightward of the vehicle width direction from the lowest end b at the bottom of the midsection 9b of the storage box 9. Therefore, the fuel injection valve 17 can be disposed with an appropriate gap between the fuel injection valve 17 and the bottom of the midsection 9b of the storage box 9 ensured, and it becomes unnecessary for the storage box 9 to be provided with a recess to prevent it from being interfered with by the fuel injection valve 17, thereby maintaining capacity of the storage box 9 and avoiding the seat height from being raised.

[0042] Also, the fuel injection valve 17 is inclined in the deviating direction relative to the vertical line c so that interference between the fuel injection valve 17 and the storage box 9 can be prevented more securely, thereby maintaining capacity of the storage box 9 and avoiding the seat height from being raised.

[0043] Furthermore, since the fuel pump 19 built into the fuel tank is disposed to a part deviating leftward of the vehicle width direction as well as forward from the lowest end a at the bottom of the forward section 9a of the storage box 9, the fuel pump can be disposed without reducing the capacity of the storage box 9. Also, the fuel tank 20 is mounted such that its rear-half section is positioned below the bottom of the forward section 9a of the storage box 9, thereby increasing the capacity of the fuel tank 20.

[0044] The fuel pump 19 is mounted to the fuel tank 20 such that the discharge opening 23d thereof is directed outward in the deviating direction, resulting in easy piping and connection of the fuel supply hose 18. Considering these points as well the fuel pump 19 can be disposed without reducing the capacity of the storage box 9 and the capacity of the fuel tank 20 can be maintained.

[0045] Also, the first and the second mounting seats 28, 28' to which the base member 27 of the fuel level detecting unit 24 is selectably and detachably mounted are formed adjacent and perpendicular to each other on the side face of the pump body 23 of the fuel pump 19, which allows the float 26 to oscillate at the two positions (the positions shown by the solid lines and the phantom lines respectively in Fig. 5) perpendicular to each other in the fuel tank 20 and allows the position where the fuel level is reliably detected based on the shape of the fuel tank or the like to be selected, thereby enabling it to handle variously shaped fuel tanks.

[0046] The base member 27 of the fuel level detecting unit 24 is also push-fitted between the left and the right rails 28a, 28a so that the engaging piece 27a of the base member 27 is engaged in each of the engaging grooves 28b formed in the mounting rails 28a to allow the fuel level detecting unit 24 to be mounted, resulting in easy mounting of the fuel level detecting unit 24.

[0047] In addition, in the above embodiment, the description in the case of the mounting seats 28 provided in two positions has been made, however, the mounting seats 28 may, of course, be provided in three or more positions. The description in the case that these mounting seats are perpendicular to each other has also been made, however, a plurality of the mounting seats may, of course, be formed adjacent to each other so as to be at angles other than 90° from each other.

Claims

1. Fuel level detecting device for fuel tanks (20) with a built-in fuel pump (19) comprising:
 - a fuel level detecting unit (24) for detecting an actual fuel level within said fuel tank (20), and
 - a mounting structure being formed at said fuel pump (19) and having a number of mounting seats (28, 28') for an alternative attachment of said fuel level detecting unit (24).
2. Fuel level detecting device according to claim 1, **characterized in that** said fuel pump (19) is placed **in that** fuel tank (20) in a generally vertical direction.
3. Fuel level detecting device according to claim 1 or 2, **characterized in that** said mounting seats (28, 28') are arranged at side faces of said fuel pump (19) thereby enclosing an angle (α) between one another.
4. Fuel level detecting device according to claim 3, **characterized in that** said angle (α) enclosed between two adjacent mounting seats (28, 28') is preferably 90°.
5. Fuel level detecting device according to one of the claims 1 to 4, **characterized in that** said fuel level detecting unit (24) comprises a base member (27) detachably mountable to a selected one of said mounting seats (28, 28') of said mounting structure and a floatable means (26) being connected to said base member (27).
6. Fuel level detecting device according to claim 5, **characterized in that** said base member (27) comprises a sensor generating an output signal according to a position of said floatable means (26).

7. Fuel level detecting device according to one of the claims 5 or 6, **characterized in that** said floatable means (26) is connected to said base member (27) via an arm (25) thereby being capable of performing an oscillating movement with respect to the base member (27). 5
8. Fuel level detecting device according to one of the claims 5 to 7, **characterized in that** said floatable means (26) is designed to oscillate at different positions in the fuel tank (20) according to the selected mounting seat (28, 28'). 10
9. Fuel level detecting device according to one of the claims 5 to 8, **characterized in that** said floatable means (26) is designed to oscillate about a mounting position of said arm (25) at said base member (27) at positions in the fuel tank (20) being generally perpendicular to one another. 15
10. Fuel level detecting device according to one of the claims 5 to 9, **characterized in that** said base member (27) is connectable by means of a push-fitting connection to a selected one of said mounting seats (28, 28'), in particular by engaging pieces (27a) formed at said base member (27) engaging in engaging grooves (28b) formed in that mounting seats (28, 28'). 20
11. Fuel level detecting device according to one of the claims 1 to 10, **characterized in that** said fuel pump (19) is mounted to the fuel tank (20) in a manner that a discharge opening (23d) thereof is directed outward in a deviating direction, resulting in an easy piping and connection of a fuel supply hose (18). 25
12. Fuel level detecting device according to one of the claims 5 to 11, **characterized in that** the base member (27) of the fuel level detecting unit (24) is push-fitted between a left and a right mounting rail (28a, 28a') of a selected one of the mounting seats (28, 28'). 30
13. Fuel level detecting device according to one of the claims 5 to 12, **characterized in that** the floatable means (26) is positioned within the tank (20) at a selectively higher part (22b') adjacent to a step (22c) of said tank (20) to which said fuel pump (19) is mounted to. 35
14. Fuel level detecting device according to one of the claims 1 to 13, **characterized in that** the fuel level detecting unit (24) is made of metal or resin. 40
15. Fuel level detecting device according to one of the claims 5 to 14, **characterized in that** the floatable means (26) is made as a sealed semi-cylindrical body. 45
16. Fuel level detecting device according to one of the claims 7 to 15, **characterized in that** said arm (25) is fabricated from a rod, and a base end of said arm is oscillatory supported by said base member (27) being box-shaped. 50
17. Fuel level detecting device according to one of the claims 1 to 16, **characterized in that** said fuel pump (19) incorporates a pump mechanism in which a filter (23c) is mounted to an inlet opening (23b) at its lower end. 55
18. Motor vehicle, in particular scooter-type motorcycle, comprising a fuel tank (20) with a built-in fuel pump (19) and a fuel level detecting device according to one of the claims 1 to 17.

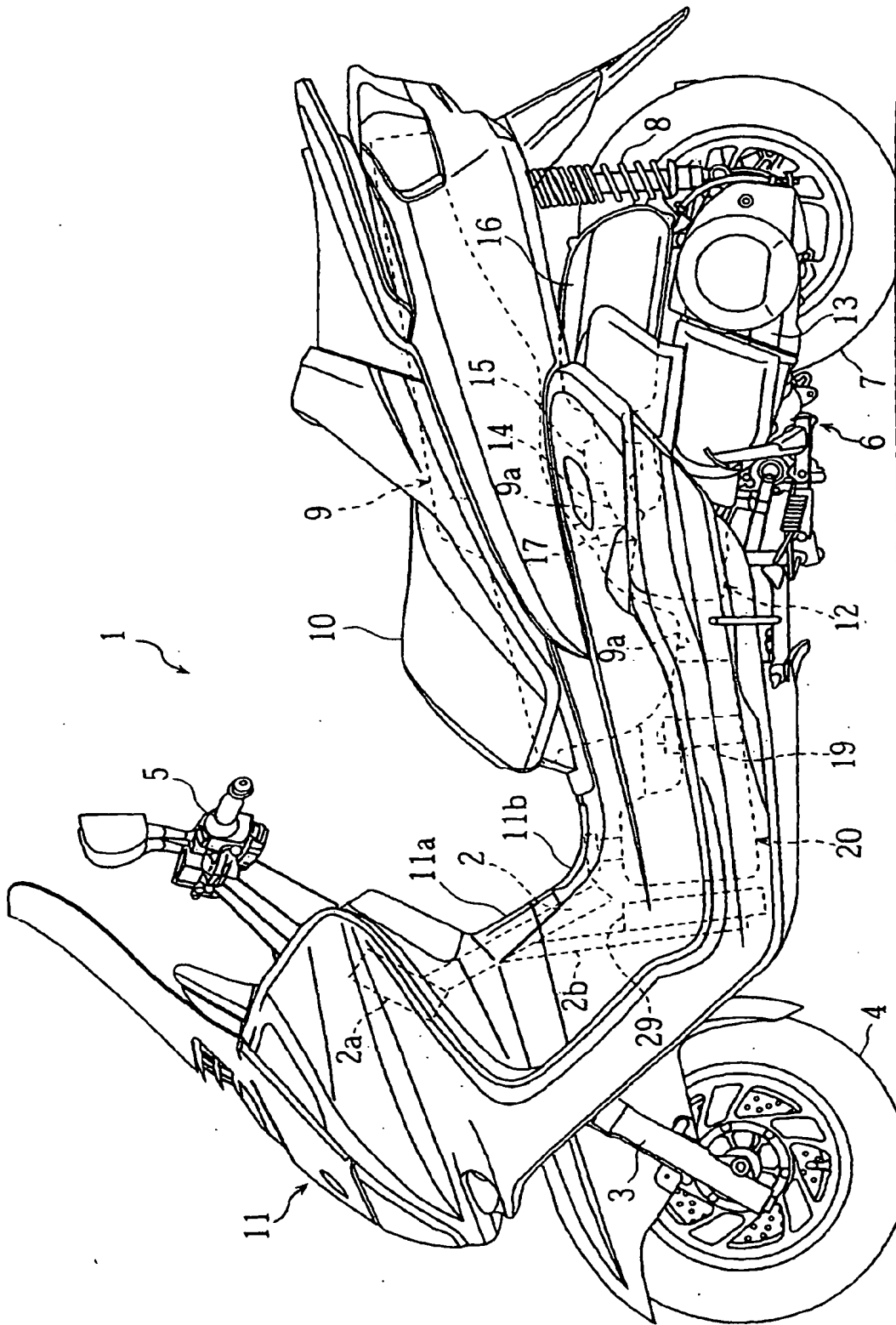


FIG. 1

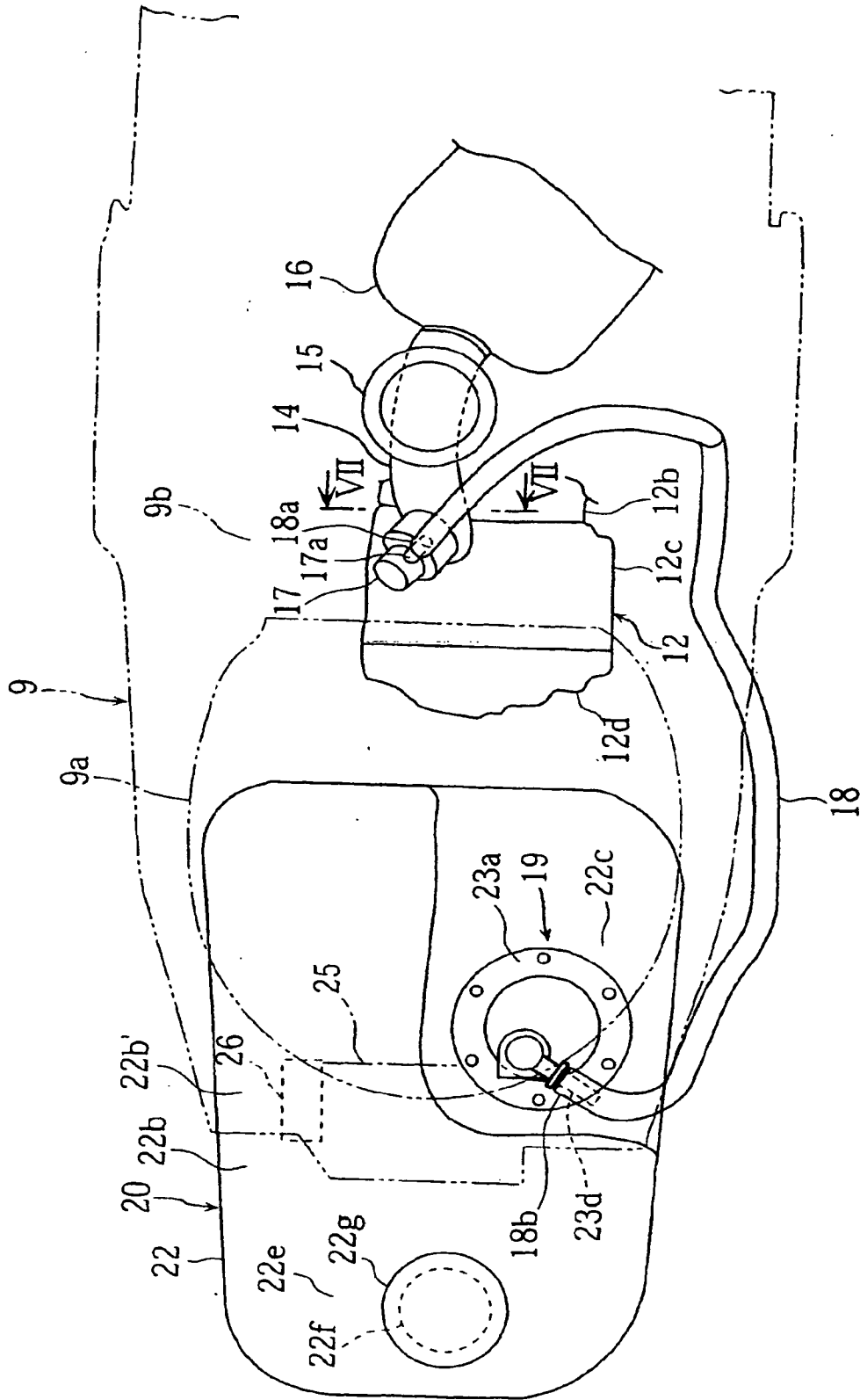


FIG. 2

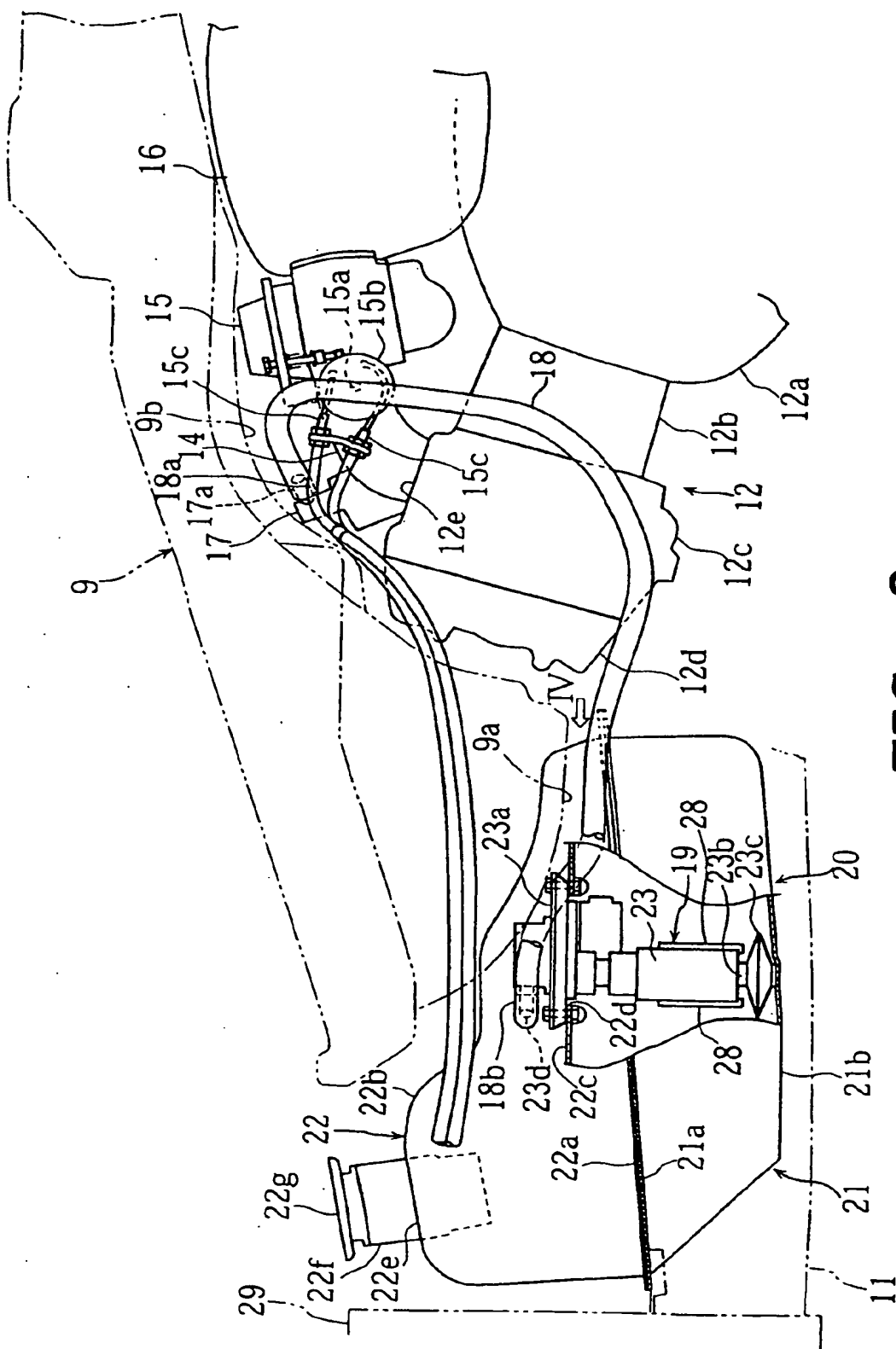
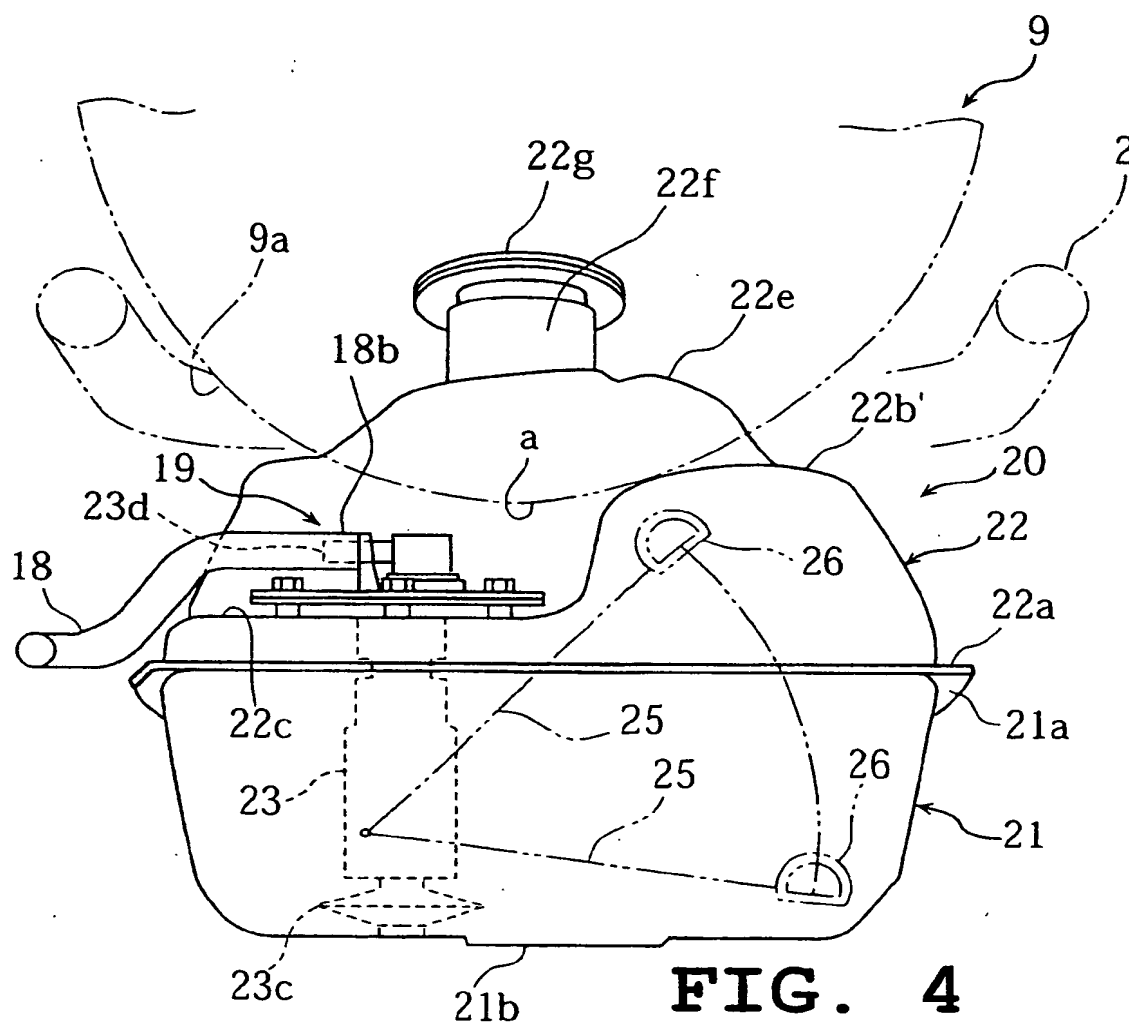


Fig. 3



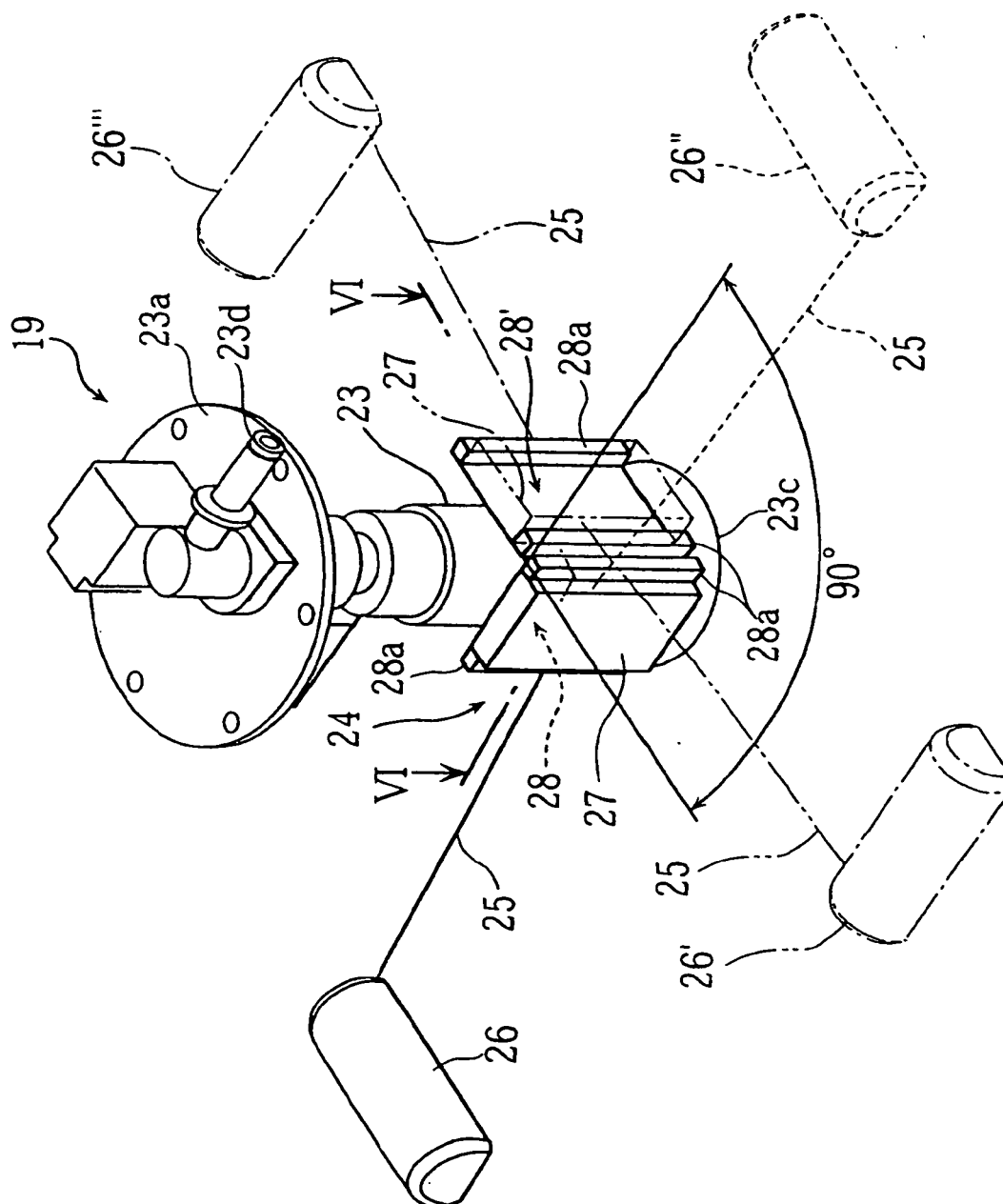


FIG. 5

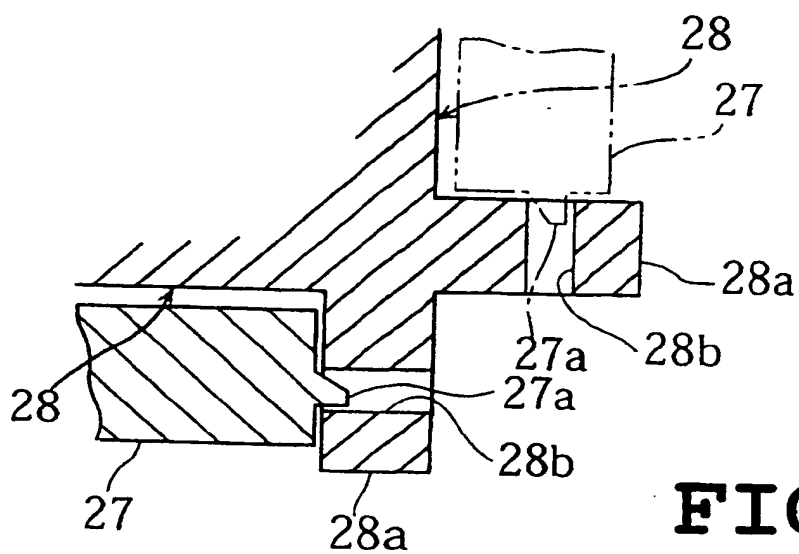


FIG. 6

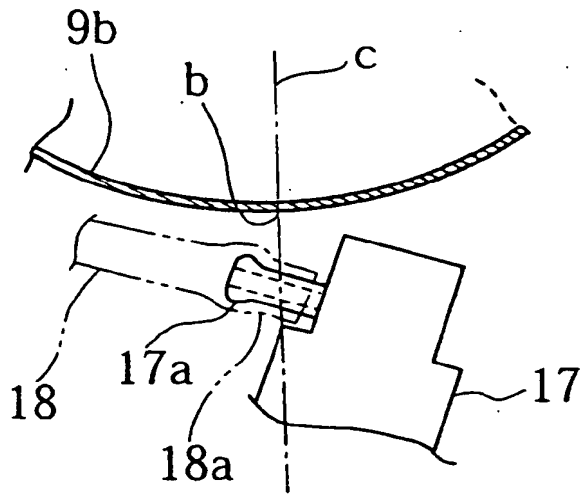


FIG. 7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 02 3044

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 6 176 133 B1 (LAZARUS STEPHEN D ET AL) 23 January 2001 (2001-01-23) * column 2; claim 1; figures 1-4 * ---	1,2,6,7, 9,11, 16-18	F02M37/10 B67D5/50 G01F23/32 G01F23/34 G01F23/76 B62J35/00
A	US 5 992 394 A (UMETSU KUNIHIRO ET AL) 30 November 1999 (1999-11-30) * column 2 - column 3; figures 1,2 * ---	1,2,6,7, 9,11,16, 17	
A	US 6 298 540 B1 (BENJEY ROBERT P ET AL) 9 October 2001 (2001-10-09) * column 1, line 19 - line 21 * * column 2, line 65 - column 3, line 3 * * column 4, line 7 - line 12; claim 1; figures 1-5 * ---	1,2,6,7, 9,11,16, 18	
A	EP 0 761 959 A (FORD WERKE AG ;FORD MOTOR CO (GB); FORD MOTOR CO (US)) 12 March 1997 (1997-03-12) * column 2, line 32 - line 40 * * column 3, line 48 - line 58 * * column 4, line 23 - line 27; figures 3-5 * ---	1,2,6,7, 9,11, 16-18	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F02M B67D G01F B62J B60K
A	US 5 303 685 A (FORGACS ROBERT L) 19 April 1994 (1994-04-19) * column 5, line 52 - line 67 * * column 8, line 65 - column 9, line 20; figures 1,2,5-8 * ---	1,2,6,7, 9,11, 16-18	
A	US 6 276 201 B1 (BOUTON ST EACUTE PHANE ET AL) 21 August 2001 (2001-08-21) * column 2, line 36 - line 54; claims 1,7,13,18,22; figures 1-3 * ---	1,2,6,7, 9,16,18	
		-/--	
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 10 January 2003	Examiner Jung, W
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03-82 (P04C01)



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 02 02 3044

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 196 15 317 A (WALBRO CORP) 31 October 1996 (1996-10-31) * figures 1-3 *	1,2,6,7, 9,11,16	
A	US 6 253 790 B1 (HARA IKUO) 3 July 2001 (2001-07-03) * column 5, line 5 - line 11; figures 2,3,4,6A,6B *	1,2,11, 18	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 10 January 2003	Examiner Jung, W
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 02 3044

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10-01-2003

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 6176133	B1	23-01-2001	NONE		
US 5992394	A	30-11-1999	JP	11101166 A	13-04-1999
US 6298540	B1	09-10-2001	AU	8614201 A	08-04-2002
			WO	0226514 A2	04-04-2002
EP 0761959	A	12-03-1997	US	5642719 A	01-07-1997
			CA	2184861 A1	12-03-1997
			DE	69611016 D1	28-12-2000
			DE	69611016 T2	22-03-2001
			EP	0761959 A1	12-03-1997
			ES	2152495 T3	01-02-2001
US 5303685	A	19-04-1994	NONE		
US 6276201	B1	21-08-2001	DE	19842336 A1	30-03-2000
			EP	0987136 A2	22-03-2000
DE 19615317	A	31-10-1996	US	5660206 A	26-08-1997
			DE	19615317 A1	31-10-1996
			FR	2733467 A1	31-10-1996
			JP	8296755 A	12-11-1996
US 6253790	B1	03-07-2001	JP	2000072074 A	07-03-2000
			DE	19938273 A1	02-03-2000
			IT	T0990704 A1	28-02-2000

EPO FORM P4469

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82